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FIG. 2

## BACKGROUND OF THE INVENTION

The present invention relates to a filtering assembly for filtering the air coming from hoods mounted in large kitchens or conveyed to air processing systems.

As known, prior filtering systems for domestic, restaurant and the like uses comprise activated carbons, which must be frequently recovered to their starting characteristics, which is very expensive.

It is also known that the mentioned activated carbon filters, upon disassembling, must be processed with water steam, possibly added with solvents, and then heated in order to be suitably cleaned.

The used solvents, as it should be apparent, must be recovered.

## SUMMARY OF THE INVENTION

The aim of the present invention is to provide such a filtering assembly which can be easily used and serviced.

Within the scope of the above mentioned aim, a main object of the present invention is to provide such a filtering assembly which can be quickly recovered and regenerated, in its assembled condition, by merely using a multi-way valve.

Another object of the present invention is to provide such a filtering assembly which is very simple construction-wise, can be easily serviced, and moreover is very reliable in operation.

According to one aspect of the present invention, the improved filtering assembly comprises an electric-filtering section, including outer plates connected to ground, therebetween there are interposed wire plates, perpendicular to the air flow to be processed, and held under a high voltage.

The air entrained fat particles and steam are positively charged in this region, so that they are ionized.

Then, in a further stage (the hydrofiltering section) the above mentioned particles are caused to drop by water sprays which are sprayed as a water rain, possibly additivated with chlorine or potassium permanganate or other reactive substances.

The water-reactive substance mixture is collected on the bottom, where it is caused to circulate by a pump, after its filtering out by means of a mechanical type of filtering unit.

The above disclosed water circulating circuit, can be switched by means of a switching valve, in order to send washing water on the inlet mechanical filtering unit and on the plates of the first electrostatic filtering stage.

In this case, actually, the washing water, driven by the same pump through ducts and nozzles, will

impinge as a water rain on the inlet mechanical filter, the diffusing filter and the electrodes of the first stage of the electrostatic filter (the electrofiltering section), so as to remove the fat particles collected thereon.

The filtering assembly, as stated, further comprises two additional mechanical filtering stages, one arranged at the inlet and the other arranged at the outlet of the system.

The stage arranged at the inlet of the system, to which there is conveyed the air to be processed, comprises a mechanical labyrinth, including perforated sheet metal elements or stretched nets, having offset holes, and operates so as to restrain thereon the fat particles and steam.

Another perforated sheet metal element is provided for adjusting the flow, so as to distribute the latter through the overall section of the filtering assembly.

The mechanical filtering stage, arranged at the outlet of the system, comprises a drop separating unit, adapted to provide an inertially operating labyrinth system, restraining the residue drops of the washing water.

The filtering assembly is so designed that the air to be processed is caused at first to descend and then to raise.

In particular, this air, during its descending movement, passes through the nozzle pipes including nozzles for cleaning the underlaying filter, the inlet mechanical filter, a diffusing filter, further pipes including washing nozzles for cleaning the underlaying filter, the electrical filtering section and hydrofiltering section.

Then, this air is displaced upwardly through a stack and finally passes through the outlet mechanical filter.

In particular, the subject filtering assembly has been so designed as to allow an easy access to the filtering units, and this by means of removable panels of broad surface and inspection windows allowing to see the washing water.

According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by a filtering assembly, particularly designed for filtering the air coming from hoods installed in large kitchens, characterized in that said filtering assembly comprises a mechanical filter unit, a diffusing unit, an electrical filtering unit, a hydrofiltering unit and an inertial mechanical filter.

## BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the invention will become more apparent hereinafter from the following detailed disclosure of a pre-

ferred, though not exclusive, embodiment of a filtering assembly specifically designed for filtering air coming from hoods installed in large kitchens, which is illustrated, by way of an indicative, but not limitative example, in the figures of the accompanying drawings, where:

Figure 1 is a partial phantom view illustrating the overall filtering assembly according to the present invention;

and

Figure 2 is a cross sectional view illustrating the subject filtering assembly.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the figures of the accompanying drawings, the filtering assembly, specifically designed for filtering air coming from hoods installed in large kitchens, according to the present invention, comprises a filtering body including, in a cascade relationship, a plurality of filtering units.

The latter, in particular, comprise a prefiltering unit 15, for removing fat and condensate drops, a diffusing filtering unit 20, an electrical filtering unit or section 2 for ionizing the fat and steam molecules, a hydrofiltering unit or section 3 providing a water rain, with possible reactive substances, in order to entrain the fat and steam particles and, finally, an outlet drop separating unit 19 for separating or restraining the water particles.

The pre-filtering unit 15 comprises a mechanical type of labyrinth, made of perforated metal sheet elements, stretched nets including offset holes or constructed by other equivalent methods, in order to restrain the fat or steam particles supplied to said pre-filtering unit 15.

The diffusing filtering unit 20 comprises a perforated sheet metal element and is designed for diffusing the air to be processed through the overall cross-section of the filtering assembly.

The electrical-filtering section 2, or ionizing barrier, comprises plates 17, which are connected to the ground, and therebetween there are arranged tungsten wires 16, which are perpendicular to the air flow, and to which there is applied a high positive voltage.

The plates of the high voltage circuit of the electrical-filtering unit are power supplied by a power supply unit.

In particular, said tungsten wires 16 are connected to equipotential metal bars, supported by insulating elements 18.

The particle to be filtered in this region are ionized and removed in the subsequent stage, that is in the hydrofiltering section or unit 3.

The hydrofiltering section 3, in particular, comprises a region including a plurality of nozzles 12

for providing a water rain, which can possibly include also reactive substances, for picking up and entraining the already ionized fat particles.

In this step, the air speed is of about 2 m/s.

The outlet drop separating unit 19 comprises offset grids, so arranged as to provide a labyrinth system, which operates in an inertial manner, so as to restrain the water drops.

This filtering assembly is further provided with a washing section 1 for washing the prefiltering unit 15, the diffuser filter 20 and the electrical filter section 2 plates, as well as plates 17 and wires 16 to be used for the maintenance of the filtering assembly.

This washing section comprises moreover pipes 11 for conveying the water-reactive substance mixture and for spraying this mixture through the washing nozzles 14 for washing the prefiltering unit, and the washing nozzles 13 for washing the filter on the above mentioned parts, in order to hold free the passages and prevent short-circuits because of the presence of residues between the plates.

The washing water, added with possible reactive substances, is collected in a collecting basin 22, arranged under the filtering assembly, from which it is sucked by a pump 10, through a filter 9 for the residues, and sent through the two-way valve 21 to the hydrofiltering section 3 or to the washing circuit, for the daily service.

The residue filter 9 separates from the water possible solid materials present herein.

The water is then recirculated, whereas the fat particles are processed by chlorine or are oxidized.

The water level in the water collecting basin 22, is adjusted by means of a float valve 7.

The water, on the other hand, is drained through the outlet fitting 8.

Moreover, it is possible to visually control the water level through an inspection window 21.

The air passage section to the filtering assembly is enlarged near the electric-filtering unit 2, so as to reduce the air speed in order to optimize its ionization.

At the enlargement of the electrical filtering unit 2, the inlet duct to the drop separator 19 is narrowed in order to accelerate the processed air.

The filtering assembly has been designed so as to greatly facilitate its maintenance.

In particular, the inner components of the filtering assembly can be easily disassembled.

The ground plates are firmly connected and restrained, and moreover, the outer panels can be easily removed, and two inspection doors 4 are provided for the electrical filtering unit, and a further door 5 is provided for the collecting basin 22, near the pump 10 and the residue filter 9.

In this connection it should be pointed out that the subject filtering assembly has been designed so as to comprise three discrete modules, suitably made in order to be separated from one another, but which can be easily associated in order to provide the above disclosed overall construction features.

The above mentioned three modules respectively comprise a washing assembly 60 for washing the plates 17, which comprises the drop separator or prefilter 19, the pipes 11 for conveying the washing water, provided with the nozzles 13 and 14 and a perforated sheet metal element 15 which operates as a prefilter.

The second module 70 comprises, on the other hand, the electrical filtering section or unit, in which there are housed the plates 17 and wires 16, as well as their supporting elements 71 which rest on the insulators 18.

The third module comprises the hydrofilter section 80, which includes the ducts 11, nozzles 12, and the two-way valve 21, the pump 10 and collecting basin 22. The latter is provided with a float supply valve 7 and with inspection windows 81, as well as an outlet fitting 8 arranged at the bottom of the collecting basin 22 and filter 9, and therein there are collected the sediments.

In this connection it should be further pointed out that the filtering assembly according to the present invention can also operate by reversing the air flow direction.

The subject filtering assembly, moreover, further comprises yet another filter unit 82, provided for separating the water-reactive mixture from oils and other fat or powder particles collected in the basin 22.

The inlet of the water-reactive mixture used in the basin and the draining of the latter can be automatized by using solenoid valves and analyzing sensors.

From the above disclosure it should be apparent that the invention fully achieves the intended aim and objects.

The invention, as disclosed, is susceptible to several modifications and variations all of which will come within the spirit and scope of the inventive idea.

Moreover, all of the details can be replaced by other technically equivalent elements.

In practicing the invention, the used materials, provided that they are compatible to the intended use, as well as the contingent size and shape can be any according to requirements.

#### Claims

1. A filtering assembly, particularly designed for filtering air coming from hoods installed in

large kitchens, or conveyed through air processing systems, characterized in that said filtering assembly comprises in combination two or more of the following devices; a mechanical type of filter, a diffuser, an electrical-filter section, a water hydrofilter section, and an inertial mechanical filter.

2. A filtering assembly according to Claim 1, characterized in that said inlet mechanical filter is made of sheet metal elements and/or stretched nets including a plurality of offset holes.
3. A filtering assembly according to Claims 1 and 2, characterized in that said diffuser filter comprises a perforated sheet metal element.
4. A filtering assembly according to one or more of the preceding claims, characterized in that said electrical-filter section comprises ground plates therebetween there are arranged tungsten wire assemblies, perpendicular to the air flow and to which there is applied a high positive voltage.
5. A filtering assembly according to one or more of the preceding claims, characterized in that said wire assemblies are connected to metal bars and being supported by insulators.
6. A filtering assembly according to one or more of the preceding claims, characterized in that said hydrofilter section comprises a region including a plurality of spraying nozzle for spraying a water rain possibly including reactive substances, the air speed being of about 2m/s.
7. A filtering assembly according to one or more of the preceding claims, characterized in that the outlet drop separator comprises a plurality of grids which are offset so as to provide a labyrinth system operating in an inertial way, and adapted to restrain the water drops impinging thereon.
8. A filtering assembly according to one or more of the preceding claims, characterized in that said assembly further comprises a washing device for washing the inlet mechanical filter and the electrical-filter section plates, including pipes having a plurality of nozzles for spraying the washing liquid on said bar.
9. A filtering assembly according to one or more of the preceding claims, characterized in that the washing water, and the solvent or reactive substances contained therein, are collected in

an underlaying basin therefrom they are removed by a pump, through a sediment filter and being sent, through a two way valve, either to the hydrofilter section or to the washing circuit.

10. A filtering assembly according to one or more of the preceding claims, characterized in that the sediment filter is adapted to separate water from solid materials, and in that in said filter the water is recirculated, whereas the restrained fat substances are processed by chlorine or are oxidized.

11. A filtering assembly according to one or more of the preceding claims, characterized in that the water level in the collecting basin is adjusted by a float valve, there being moreover provided a drain assembly and an inspection window for visually controlling the water level.

12. A filtering assembly according to one or more of the preceding claims, characterized in that near said electrical filter there is provided an enlargement of the cross-section of the filtering assembly, adapted to decelerate the air flow in order to optimize the ionization thereof.

13. A filtering assembly according to one or more of the preceding claims, characterized in that near said electrical filter there is provided a narrowing of the inlet duct of the outlet drop separator in order to accelerate the processed air.

14. A filtering assembly according to one or more of the preceding claims, characterized in that said ground plates are latched and fixedly restrained.

15. A filtering assembly according to one or more of the preceding claims, characterized in that said filtering assembly further comprises inspection windows.

16. A filtering assembly according to one or more of the preceding claims, characterized in that said filtering assembly comprises three discrete separate modules, which can be associated in order to provide said filtering assembly with the disclosed features.

17. A filtering assembly according to one or more of the preceding claims, characterized in that said three modules respectively comprise a washing assembly for washing said plates, including the water drop separator or prefilter, the pipes for conveying the washing water

including a plurality of nozzles and a perforated sheet metal element operating as a prefilter.

5 18. A filtering assembly according to one or more of the preceding claims, characterized in that the second module comprises the electrical filter section, including said plates and wires, as well as their supporting elements, bearing on insulators.

10 19. A filtering assembly according to one or more of the preceding claims, characterized in that the third module comprises a hydrofilter section, including a plurality of ducts and nozzles, a two-way valve, a pump and a collecting basin, said collecting basin being provided with a water supply water supply float valve and an inspection window, as well as with an outlet fitting arranged at the bottom of the collecting basin and of said filtering assembly, for collecting therein the sediments.

20. A filtering assembly, according to one or more of the preceding claims, characterized in that said filtering assembly is adapted to also operate with a reversed air flow.

21. A filtering assembly, according to one or more of the preceding claims, characterized in that said filtering assembly further comprises a filter operating to separate the water-reactive mixture from oils and other fat or powder particles collected in said collecting basin.

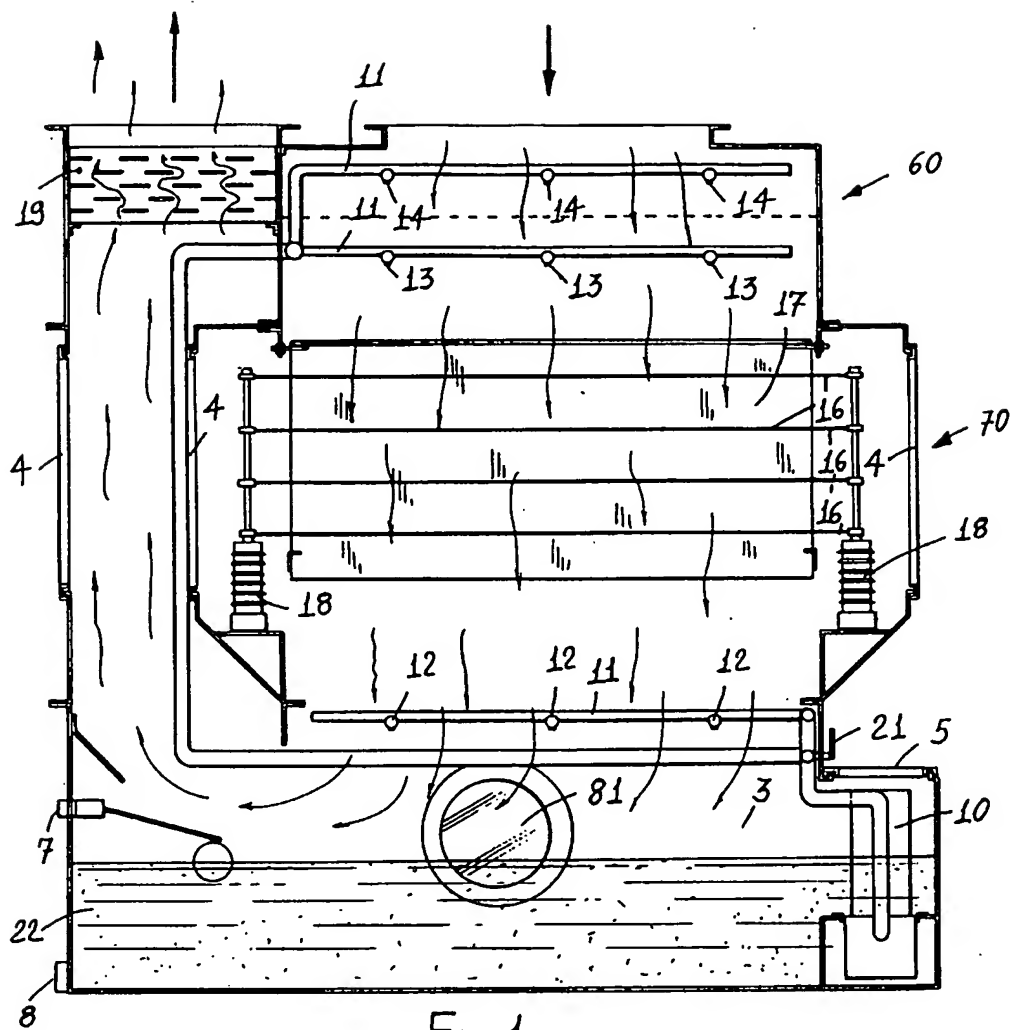


FIG. 1

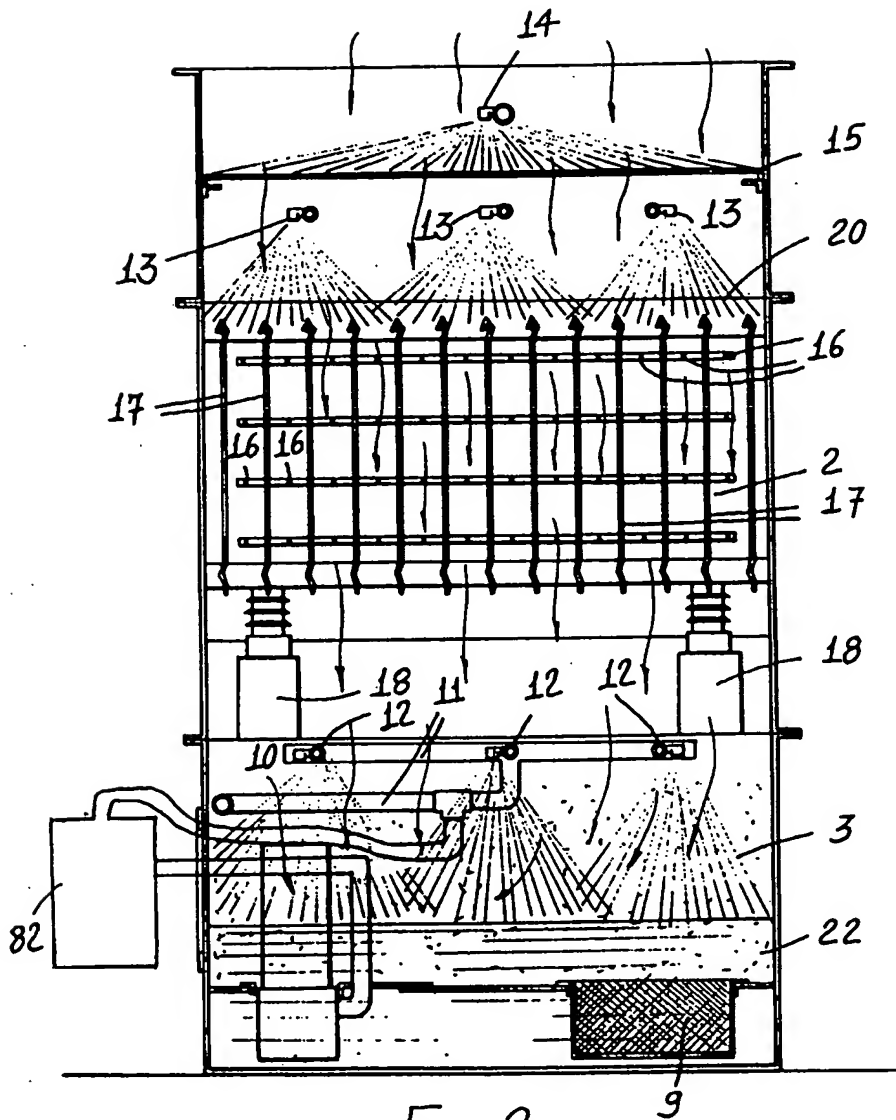


FIG. 2



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 92 83 0531

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-3 837 269 (SWEET ET AL.) * column 2, line 14 - column 4, line 9; figure 1 * ---	1,4,8,12	B01D50/00 F24C15/20
X	EP-A-0 314 085 (FOOD AUTOMATION-SERVICE TECHNIQUES) * claims 1,4-6; figure 1 * ---	1,4,16	
A	FR-A-2 663 861 (GRAVIER) * page 5 - page 7; figure 1 * ---	1-3,6-8	
A	CA-A-1 091 144 (COMINCO LTD) -----	1-3,6-10	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B01D F24C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 JULY 1993	Examiner CUBAS ALCARAZ J.L.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	